

OCO-2 Status

July 25, 2017

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Science Team
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Technology**



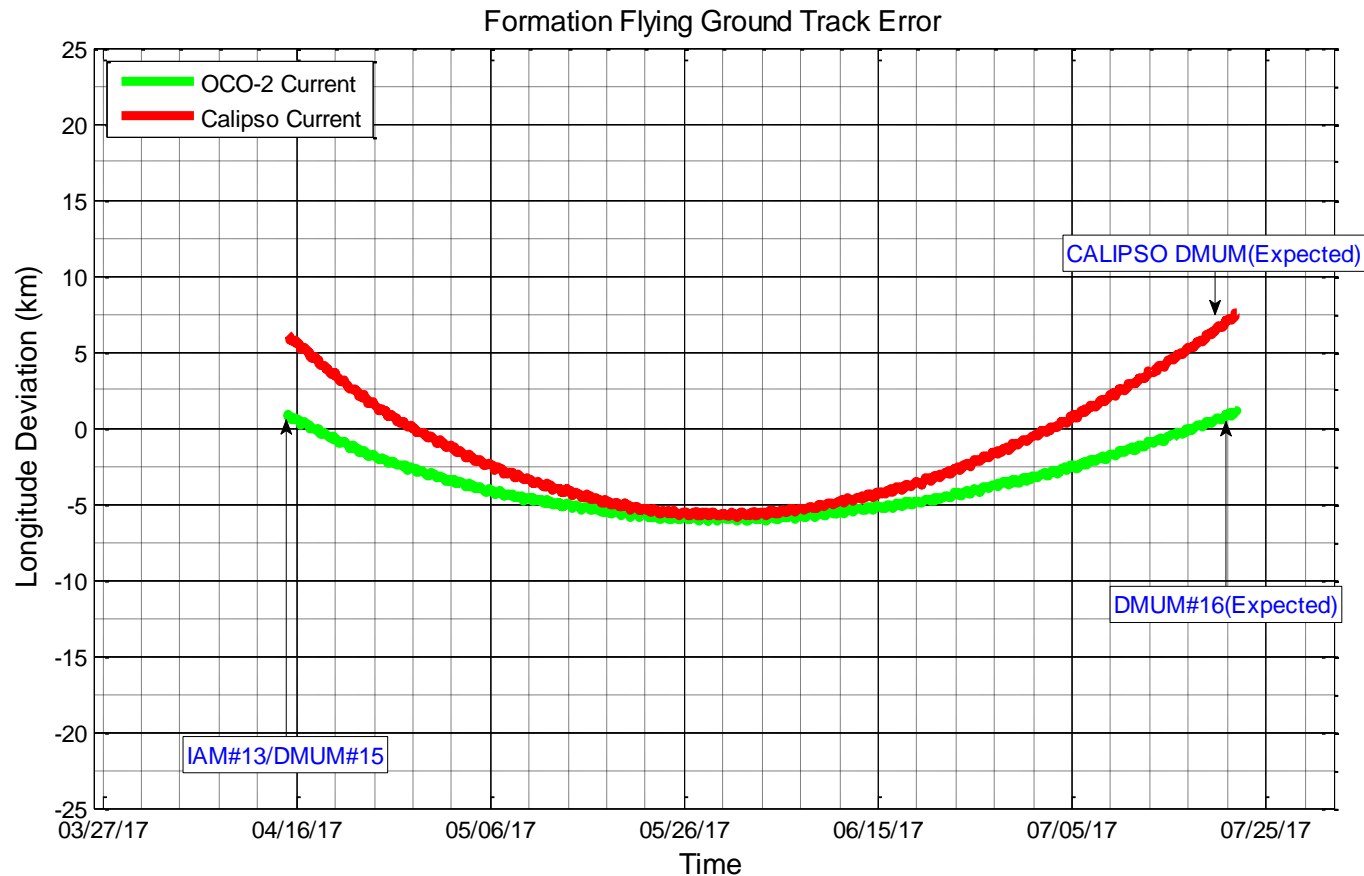
Overview

- **Observatory Status: Nominal**
 - Drag Make-up Maneuver (DMUM) executed on July 20
 - Next TanSat crossing is 7 September
- **Instrument Status:**
 - **An instrument reset is needed to correct an anomaly. The reset and decon are currently being planned for July 31 – 3 August**
- **V8 Testing and Implementation**
 - The Level 2 B8r production started, but was interrupted by planned maintenance activities
 - Data filtering and bias correction efforts are ongoing
- **Planning for the 2017 AGU and 2018 AMS Meetings**
- **Meetings and Events supported by OCO-2 Team Members**



OCO-2 and CALIPSO Ground Tracks

EAST



WEST

The OCO-2 Nadir and CALIPSO ground tracks have remained well aligned since the last Inclination Adjust Maneuver in April. A Drag Make-up Maneuver (DMUM) was executed on July 20. **The next OCO-2/TanSat conjunction will occur on 7 September**

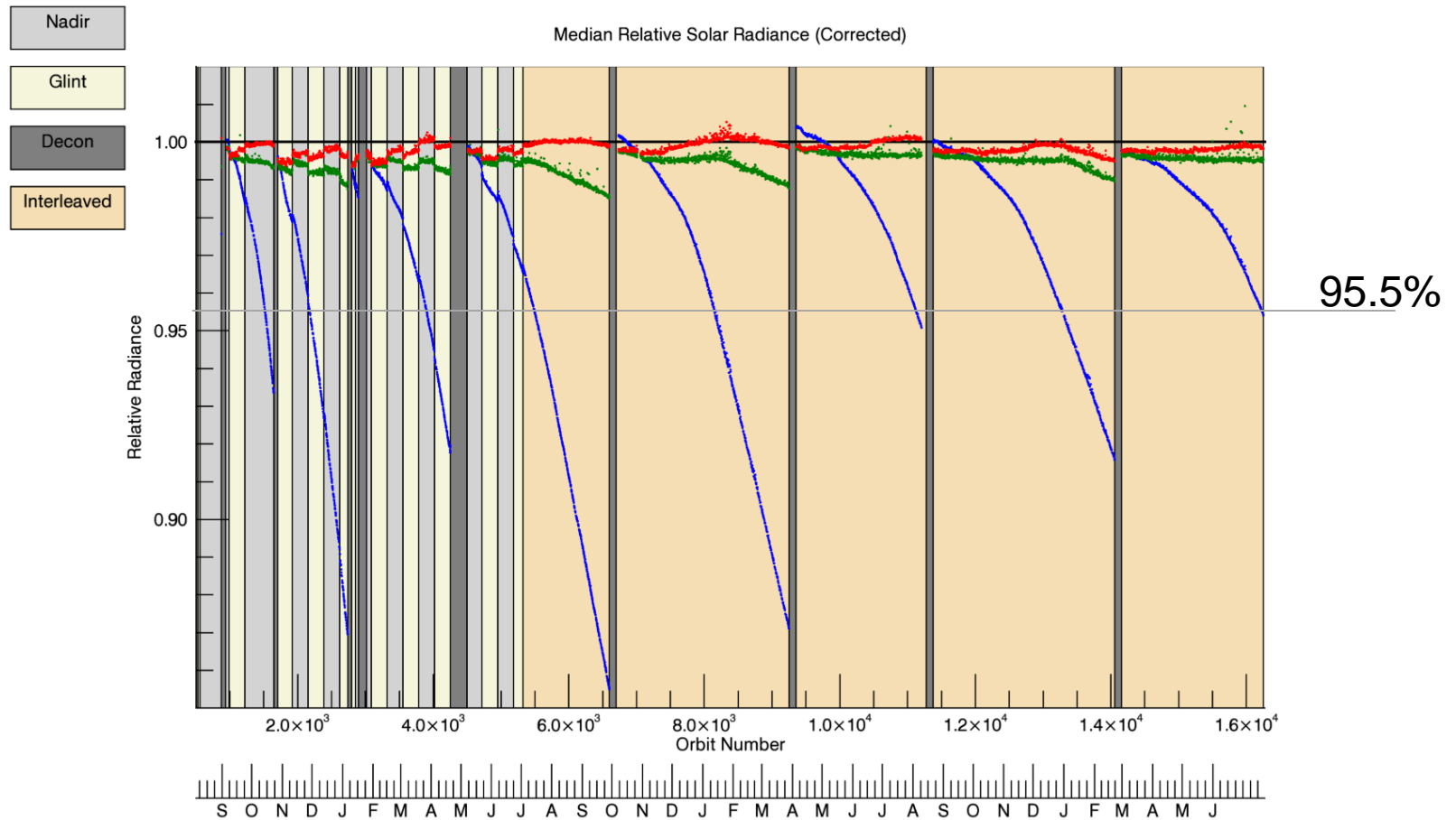


The Instrument Reset and Decon

- The instrument needs to be reset to address a commanding issue
 - Since early July, the instrument controller has not been executing Optical Bench thermal control commands
 - The Mission Operations team team investigating root cause
 - The current theory is that this is due to a corrupted memory location, which could be corrected by rebooting the instrument
- The instrument reboot will allow the focal plane arrays (FPAs) to warm up. We have therefore chosen to execute a nominal 12 C instrument decontamination cycle
- The current plan is to execute the reset command on 7/30/2017
- If all goes as planned, the instrument could be back at operating temperature and stable sometime on August 3, 2017
- The instrument will produce no data during this ~5 day period
 - This precludes data acquisition during part of the ASCENDS Arctic campaign, which extends from July 27 – August 8



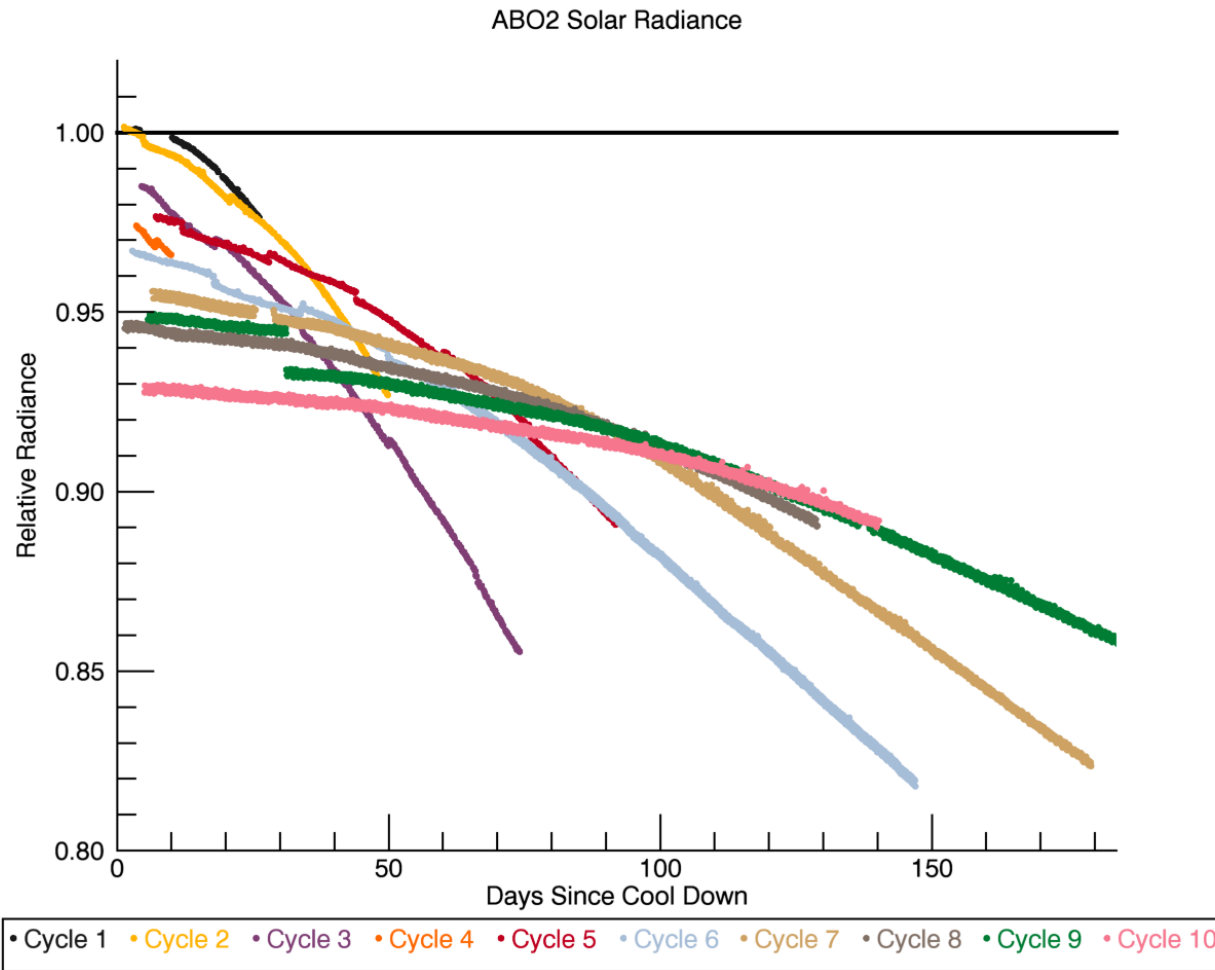
OCO-2 Instrument Trending



Rate of ice accumulation continues to decrease. **An Instrument Reset and Decon are currently being planned and will interrupt observations from July 31 – August 3.**



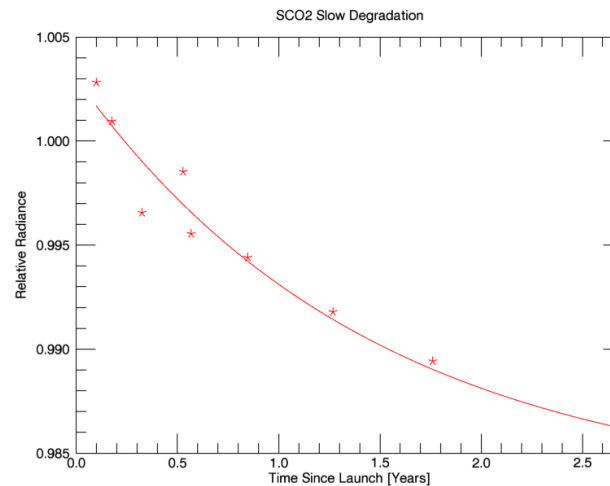
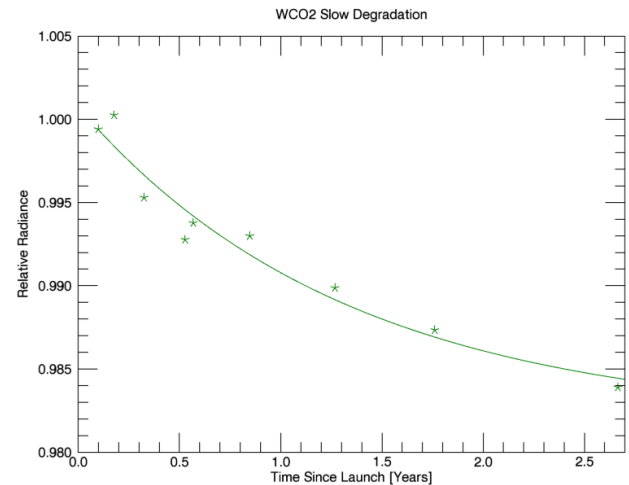
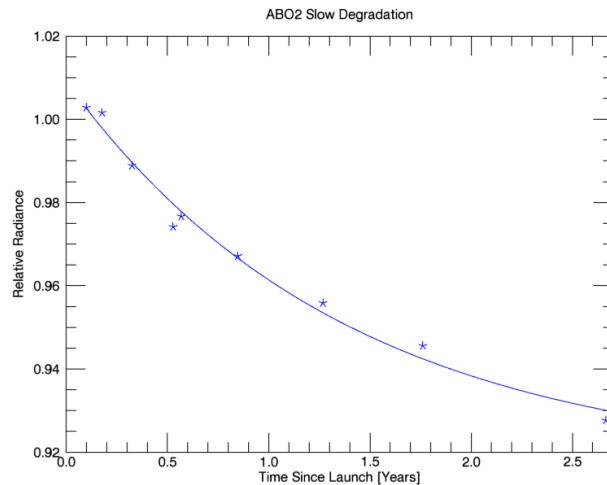
FPA Ice Accumulation Rate



The ice accumulation rate on the ABO2 FPA continues to decrease with time.



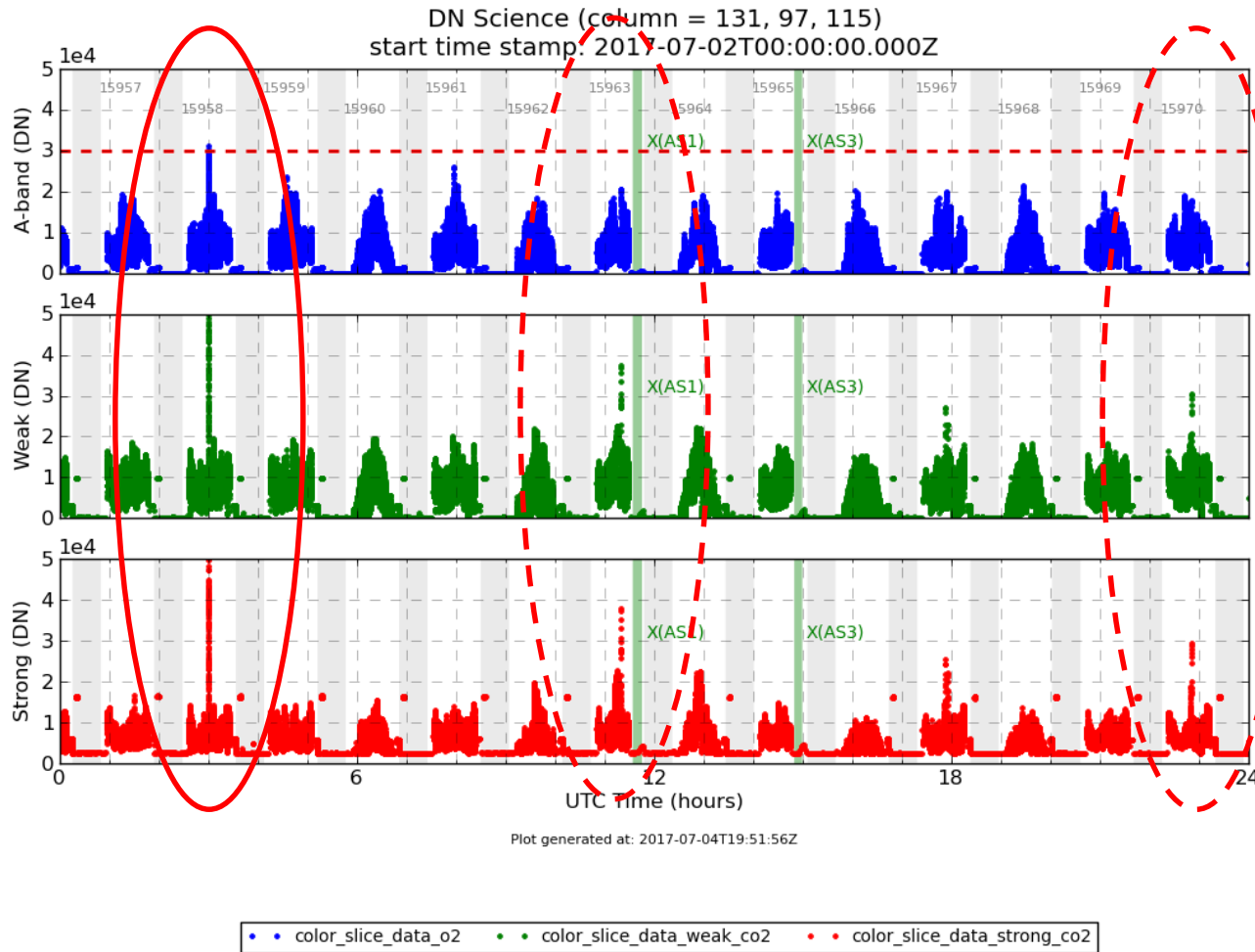
Slow Degradation of the Solar Diffuser



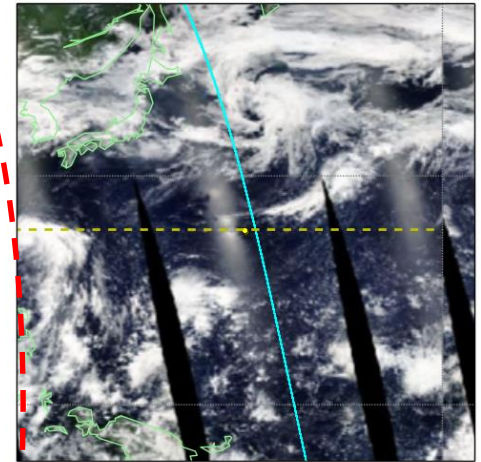
The slow degradation of the solar diffuser is now being tracked separately.



Possible Saturation Event: July 2, 2017, Orbit 15958



Saturation event(s) for 2017-07-02. Orbit: 15958



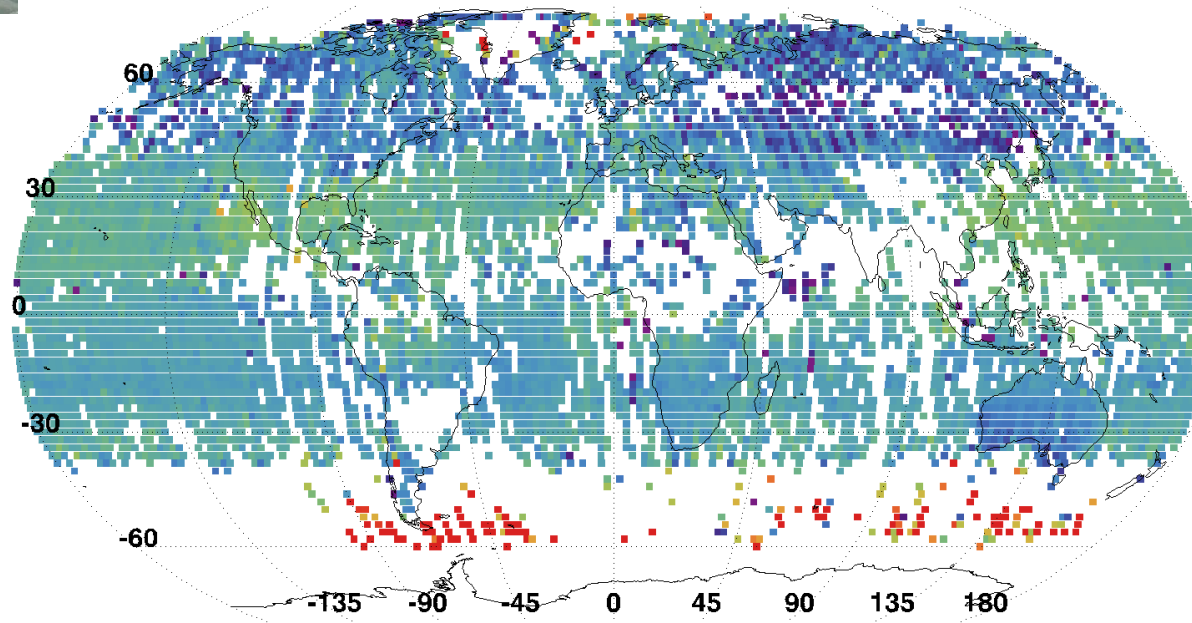
A bright ocean glint exposure southeast of Japan exceeded the saturation warning limits on 7/2. These events are more common during the summer due to the sun's beta-angle.



July X_{CO_2} Data (forward stream)



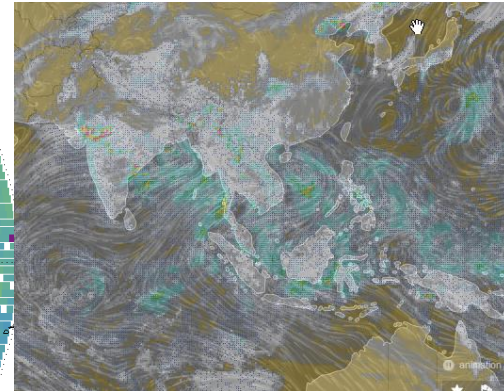
Mean X_{CO_2} - Jul 2017



Mean X_{CO_2} (ppm)

395.000 401.250 407.500 413.750 420.000

24 Jul 2017
Ops B7302 r0x



July 13 cloud forecast
from www.windy.com

The first 3 weeks of July is looking as expected. Note the impact of the summer monsoon over Asia. **High X_{CO_2} values over Southern Ocean are under investigation.**





Aircraft Campaigns of Interest to GOSAT and OCO-2

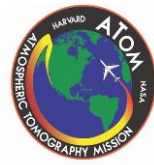
- **ASCENDS Alaska Campaign: July 27 – August 8**
 - The first and last days are transit days (typically with measurements)
 - The Alaska deployments will be between those two dates
 - **OCO-2 will miss 30 July – 3 August due to reset/decon activity**
- **ACT-America Campaign#3: October 3 – November 13.**
 - LaRC: 2-16 October
 - Lincoln Nebraska: 17-30 October
 - Shreveport, Louisiana: 31 October – 13 November
 - The ACT-America calendar is here:
<https://actamerica.larc.nasa.gov/calendar.html>
- **ATom-3: 1-26 October**
 - Preceded by shakedown and test flights from September 12-28.
 - ATom-1 data are public, see
 - <https://espoarchive.nasa.gov/archive/browse/atom>
 - ATom-3 calendar is here:
<https://espo.nasa.gov/atom/calendar/2017-09>

Atmospheric Tomography

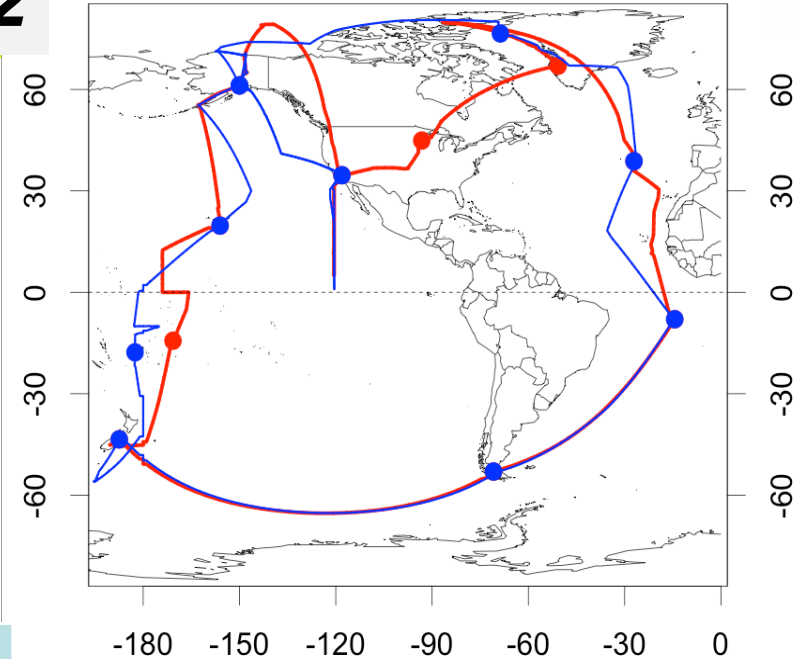
ATom Mission Phases 1 & 2

AT1: Aug 2016
NH Summer

AT2: Feb 2017
NH Winter

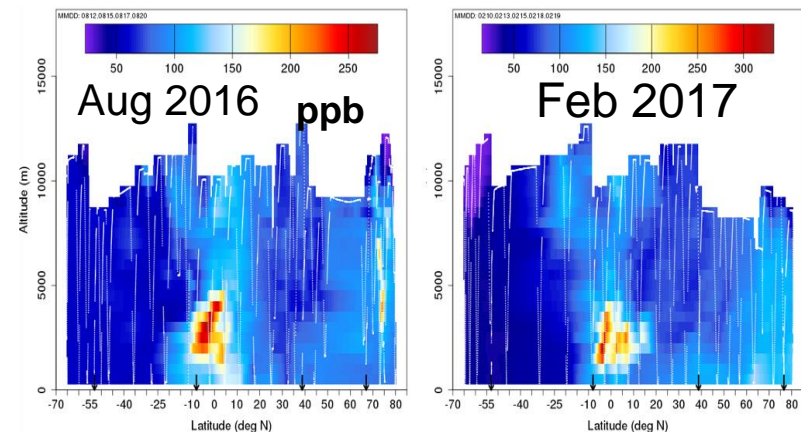


measured greenhouse gases and pollutants in the vast, remote atmosphere. **African fires have massive impacts in the tropical Atlantic, extending to the Pacific and Southern Ocean.** **The Arctic had very strong pollution from Asian pollution and summer boreal fires.**



Mission	ATom1	ATom2
Flts/Hrs	11 /94	11 / 97
Length Days	26	27
Kilometers	65700	70040
Profiles	148	142
Instruments	34	35
Parameters	450	(460)

Atlantic Carbon Monoxide (CO) Slices



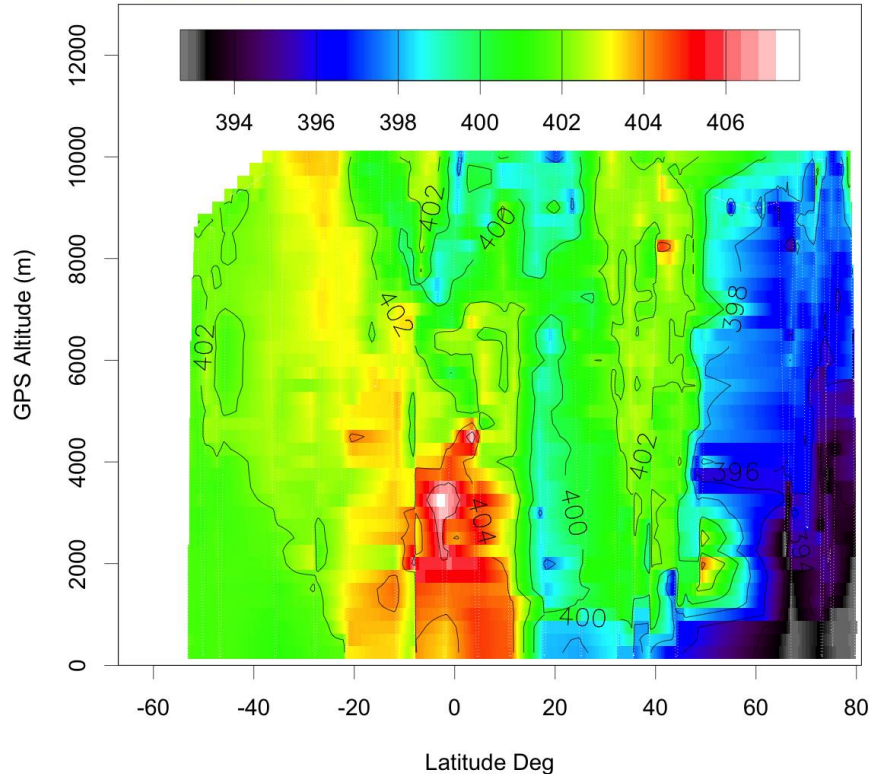


ATom 2016 CO₂ Cross-Sections

CO₂_NOAA

Fits 7 8 9

Atlantic ATom-1 Aug 2016

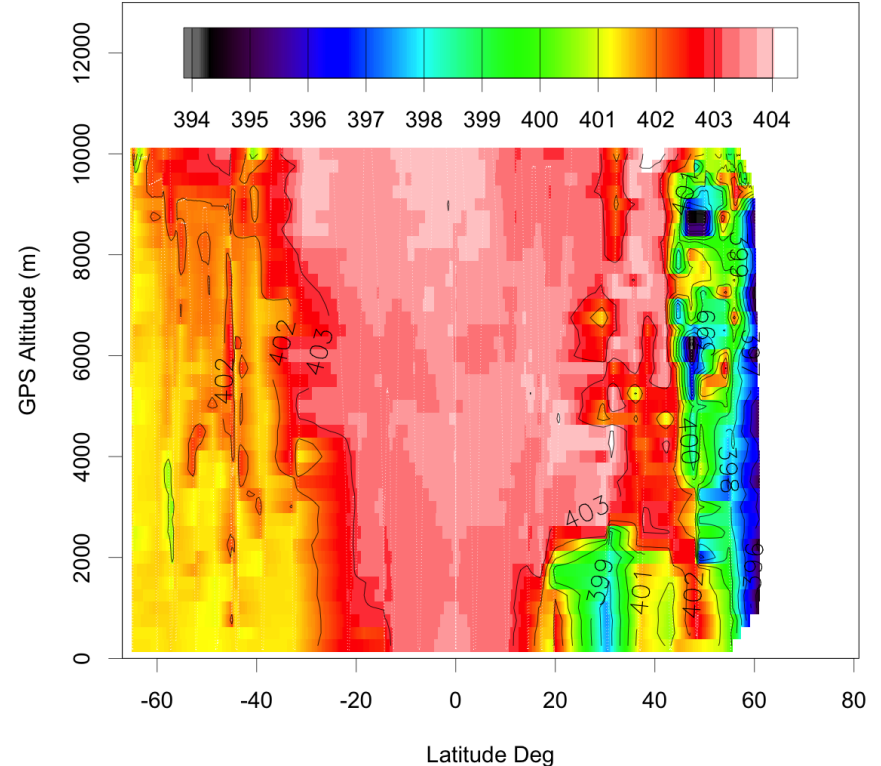


Atlantic ATom-1: August 2016

CO₂_NOAA

Fits 2 3 4 5 6

Pacific ATom-1 Aug 2016



Pacific ATom-1: August 2016

S. Wofsy et al., 2017



Publications Statistics

By **25-Jul-2017:**

- 2014: OCO-2: 7 refereed papers, 1 book chapter
- 2015: OCO-2: 8 refereed papers
- 2015: ACOS: 3 refereed papers, 1 book chapter
- 2016: OCO-2: 18 refereed papers
- 2016: ACOS: 12 refereed papers
- 2017: OCO-2: **14** refereed papers, **6** in press (5 papers in Science/GRL Collection **(9/29 publication)** + Worden et al.)
- 2017: ACOS: 2 refereed papers



Ongoing Work for V8

Annmarie Eldering

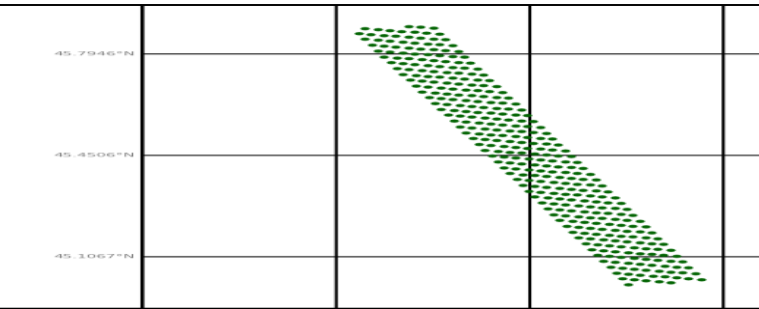
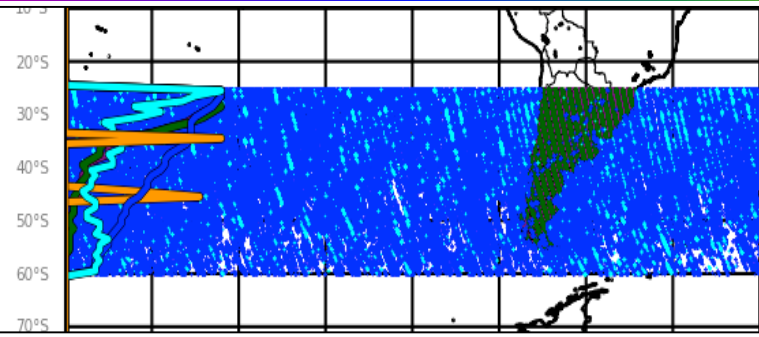


V8 data product development

- Updated data product in product. Working towards a complete reprocessing by end of Sept.
 - Updated radiometric calibration
 - Changes to retrieval process, including addition of stratospheric aerosols and more realistic treatment of how land surface reflect
 - **V8r L1b data product is complete through 30 June 2017**
 - **V8r L2 data production has started and is expected to take 3 months**
 - Using OCO-2 cluster, NASA supercomputer, and Amazon cluster
 - Bias Correction and data screening in development. Aiming to complete that work by the end of July
 - Lite file production to follow.



3 Metrics, 3 Methods



Southern Hemisphere Approximation

- Extends over entire time range
- Has real seasonal /annual time dependence
- Has real & fictitious latitude gradient
- Don't know const XCO2 bias term = STD
- **Mean Monthly STDEV removes time effect**

Small Areas

- Extends over all time and space
- Automatically Removes Time/Space Trends
- Can't detect global features
- **Don't know const XCO2 bias term = STD**

Direct TCCON Differencing

- Limited time & space
- Limited atmospheric param sampling
- Actually know const XCO2 bias term
- **Most relevant metric: RMS diff**

All are in units of ppm

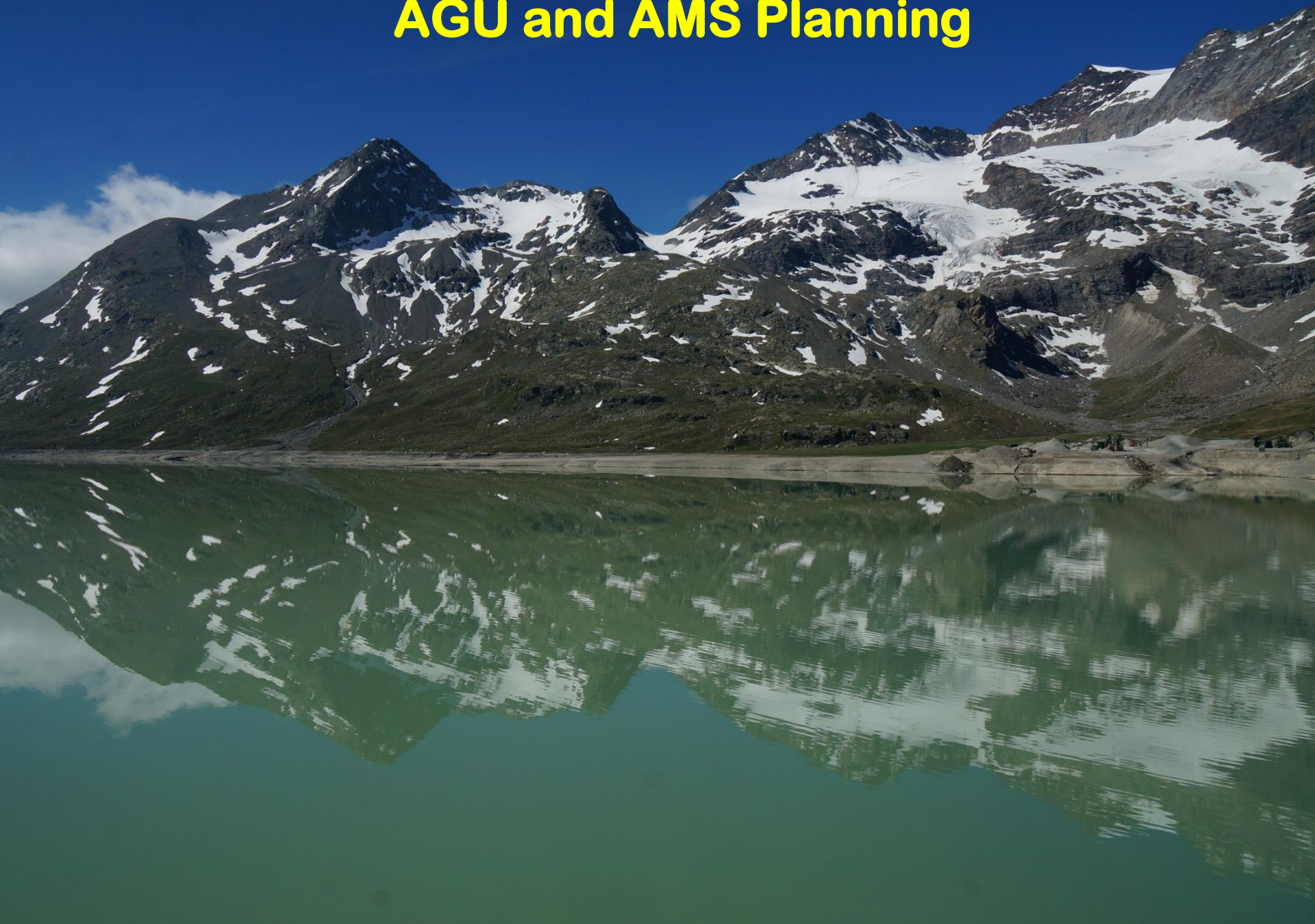


Filtering strategy in development for v8

- Many of the same variables that were used in v7 were selected for the warn levels of v8, but there are some new ones. We are investigating, but the currently, we think these are related to broken clouds that are impacting retrievals

	Lnd Glint	Lnd Nadir	Lnd ALL	Sea Glint
max_declocking_factor_WCO2	<	<>	<>	<
co2_ratio	>	>	>	
surface_roughness	>	>	>	
dP_fph		<	<	<
log(DWS)	>			
co2_grad_del				<
eof_3_scale_strong_co2				>
sig_ratio_SCO2_over_O2				<

AGU and AMS Planning





AGU Sessions

AGU Abstract Deadline, 2 August 2017

- **A089: Remote Sensing of CH₄ and CO₂ from Space: The Advancing Observing System - Session ID#: 24061**
- **A030: Constraining Biosphere-Atmosphere Exchange Processes using Remote-sensing and In Situ Observations - Session ID#: 25481**
- **B066: Sun-induced chlorophyll fluorescence as a proxy of photosynthesis: measurements, modeling, and applications from field, airborne, and satellite platforms Session ID#: 23635**
- **GC078. The 2nd State of the Carbon Cycle Report (SOCCR-2): A Special Assessment of the Last Decade of Carbon Cycle Science in North America and Adjoining Oceans - Session ID#: 25319**
- **Other activities: GOSAT/OCO-2 TIM at AGU**



AMS Sessions

AMS Abstract Deadline, 1 August 2017

- **20th Conference on Atmospheric Chemistry**
 - Greenhouse Gases
 - Atmospheric Composition and Modeling
 - The ATom Mission
 - Regional Air Quality Observations and Modeling

Upcoming activities





OCO-2 Team Activities

- **Upcoming Meetings**
 - 6-11 August, AOGS, Singapore
 - 21-25 August, ICDC10, Interlaken, Switzerland
 - 11-14 September, 2017 CEOS SIT Technical Workshop, Frascati, Italy
 - 2-6 October, EUMETSAT-2017, Rome, Italy
 - **25-27 October 2017, OCO-2 Science Team Meeting, NCAR, Boulder, CO, USA**
 - 11-15 December, 2017: AGU Fall Meeting, New Orleans, LA, USA
 - 7-11 January, 2018: MS Annual Meeting, Austin, TX, USA